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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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June 1970

U.S. Training and Employment Service
Technical Report
S-100R

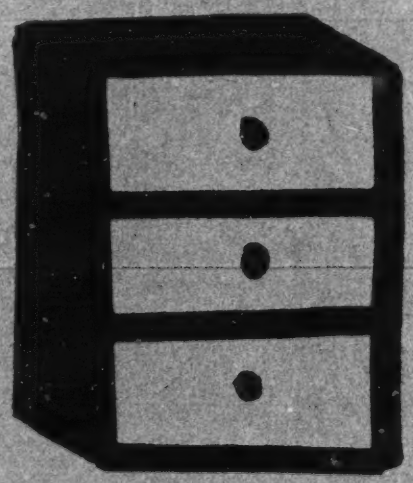
Development of USTES

APTITUDE TEST BATTERY FOR

CABINETMAKER

(woodworking)
660.280

U.S. DEPARTMENT OF LABOR
Manpower Administration



TM 001 473

Technical Report on Development of USTES Aptitude Test Battery

For . . . .

Cabinetmaker (woodworking) 660.280-010

S-100R

(Developed in Cooperation with the Minnesota
and Nebraska State Employment Services)

U.S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study #2128, 2512

Development of USTES Aptitude Test Battery

For

Cabinetmaker (woodworking) 660.280-010

S-100R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Cabinetmaker (woodworking) 660.280-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N - Numerical Aptitude	85
S - Spatial Aptitude	105
M - Manual Dexterity	85

Research Summary

Sample:

81 male students enrolled in courses in Cabinetmaking in Minnesota.

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status is unknown.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .36 ($P/2 < .005$)

Effectiveness of Norms:

Only 69% of the nontest-selected students used for this study were good students; if the students had been test-selected with the above norms, 84% would have been good students. Thirty-one percent of the nontest-selected students used for this study were poor students; if the students had been test-selected with the above norms, only 16% would have been poor students. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Students	69%	84%
Poor Students	31%	16%

SAMPLE DESCRIPTION

Size:

N = 81

Occupational Status:

Students.

Work Setting:

Students were enrolled at St. Paul Vocational School and Minneapolis Vocational High School in Minnesota.

Employer Selection Requirements:

Education: None required.

Previous Experience: None required.

Tests: None used.

Other: Physical Examination.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age and Education.

	Mean	SD	Range	r
Age (years)	20.5	5.1	15-38	.172
Education (years)	10.9	1.1	8-14	.120

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A were administered during November, 1954 and April 1956.

CRITERION

The criterion data consisted of instructors' ratings of student proficiency made at approximately the same time as the tests were administered. The sub-samples from Minneapolis and St. Paul schools were combined for purposes of the statistical analysis. The criterion data for the 81 students were combined into one distribution. The mean final criterion score was 29.53, the standard deviation of scores was 9.69 and the range of final criterion scores was 9.95 to 49.76. (See Appendix)

Criterion Score Distribution:

Actual Range:	10.0-49.8
Mean:	29.5
Standard Deviation:	10.0

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 31% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 28.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes N, S, P, and Q were considered for inclusion in the norms because they have high correlations with the criterion. Aptitude M which does not have a high correlation with the criterion, was considered for inclusion in the norms because the qualitative analysis indicated that this aptitude might be important for the job duties and the sample had relatively high mean score on this aptitude. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performance)

Aptitudes	Rationale
G - General Learning Ability	Required for acquiring knowledge and understanding of the principles of cabinetmaking and applying these principles in shop work and on the job.
N - Numerical Aptitude	Required for measuring and for computing dimensions, areas, volumes and costs.
S - Spatial Aptitude	Required for visualizing three-dimensional objects from two-dimensional layouts, and for reading and interpreting blueprints and layouts.
P - Form Perception	Required for perceiving pertinent detail in blueprints and completed objects and for recognizing and perceiving symbols on blueprints.
M - Manual Dexterity	Required for skillful use of hands and arms in using hand and machine tools and for finishing completed objects.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N=81

	Mean	SD	Range	r
G - General Learning Ability	102.5	12.5	76-138	.422**
V - Verbal Aptitude	93.6	11.6	68-131	.070
N - Numerical Aptitude	100.4	13.6	57-128	.400**
S - Spatial Aptitude	115.2	17.0	81-156	.428**
P - Form Perception	106.1	14.3	76-147	.381**
Q - Clerical Perception	99.3	10.7	75-127	.392**
K - Motor Coordination	96.0	15.8	51-144	.163
F - Finger Dexterity	102.6	18.1	54-143	.081
M - Manual Dexterity	113.5	18.8	75-151	.051

**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X		X	X	X				X
Irrelevant									
Relatively High Mean				X	X				X
Relatively Low Standard Dev.	X	X	X			X			
Significant Correlation With Criterion	X		X	X	X	X			
Aptitudes to be Considered for Trial Norms	G		N	S	P	Q			M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G,N,S,P,Q, and M at trial cutting scores were able to differentiate between the 69% of the sample considered to be good workers and the 31% of the sample considered to be poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one -third of the sample with three-aptitude norms. For four-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample. The Phi coefficient was used as a basis for comparing trial norms. Norms of N-85, S-105, and M-85 provided optimum differentiation for the occupation of Cabinetmaker (woodworking) 660.280-020. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .36 (statistically significant at the .005 level).

TABLE 6

Concurrent Validity of Test Norms
N-85, S-105, and M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Students	15	41	56
Poor Students	17	8	25
Total	32	49	81

Phi Coefficient = .36 Chi Square (X^2_y) = 10.6

Significance Level = $P/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-37 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .23 is obtained when the OAP-37 norms of N-80, S-95, and M-85 are applied to both validation and cross-validation samples.

CHECK STUDY RESEARCH SUMMARY SHEET FOR S-100R

S-100R GATB Study #2512

Cabinetmaker (woodworking) 660.280-010

Check Study #1 Research Summary

Sample:

31 males employed as Cabinetmakers by Watson Store Fixtures Company in Fremont, Nebraska.

This study was conducted prior to the requirement of providing minority group status. Therefore, minority group composition is unknown.

TABLE 7

Mean, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience and Aptitudes o the GATB. N = 31.

	Mean	SD	Range	r
Age (years)	41.5	15.8	18-70	.170
Education (years)	10.6	18.6	6-14	-.004
Experience (months)	29.6	23.2	1-66	.655**
G - General Learning Ability	104.0	15.2	75-136	.332
V - Verbal Aptitude	98.2	16.3	66-127	.228
N - Numerical Aptitude	99.3	13.7	72-124	.232
S - Spatial Aptitude	106.8	19.5	68-143	.458**
P - Form Perception	95.1	22.2	50-139	.222
Q - Clerical Perception	93.3	13.1	63-117	.236
K - Motor Coordination	94.2	15.6	53-120	-.025
F - Finger Dexterity	91.9	24.9	42-135	.005
M - Manual Dexterity	92.2	24.0	43-154	.093

**Significant at the .01 level

Criterion:

Supervisory ratings

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Concurrent Validity:

Phi Coefficient = .34 ($P/2 < .05$)

Effectiveness of Norms:

Only 64% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-100R norms, 91% would have been good workers. Thirty-six percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-100R norms only 9% would have been poor workers. The effectiveness of the norms when applied to this independent sample is shown graphically in Table 8:

TABLE 8

Effectiveness of S-100R Norms
on Check Study Sample #1

	Without Tests	With Tests
Good Workers	64%	91%
Poor Workers	36%	9%

TABLE 9

Concurrent Validity of S-100R Norms
on Check Study Sample #1

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	10	20
Poor Workers	10	1	11
Total	20	11	31

Phi Coefficient = .34
Significance Level = $P/2 < .05$

Chi Square (X^2_y) = 3.6

Instructors' DESCRIPTIVE RATING SCALE

Item Description	Average Weight
1. How good is the quality of his work?	20.91
2. How fast has he caught on to new jobs and operations?	6.62
3. How accurately does he do his work?	16.41
4. How much work does he get done?	21.66
5. How much knowledge does he have of his work and other related work?	10.00
6. How carefully does he check the material he works with?	11.00
7. When something different comes up, how well does he cope with it?	3.94
8. How well and accurately does he communicate with others?	6.00
9. How often does he contribute practical suggestions?	3.44

FACT SHEET

Job Title

Cabinetmaker (woodworking) 660.280-010

Job Summary

Makes high-grade wooden articles such as furniture, office equipment, and store fixtures by cutting, shaping, and assembling parts, using hand and machine woodworking tools.

Work Performed

Plans and lays out work: Studies work orders, drawings, blueprints, or other specifications to determine dimensions of wooden article and type of stock to be used; plans sequence of cutting and shaping operations; obtains stock and measures off required dimensions on stock or on paper pattern with such instruments as scale, protractor, calipers, dividers, or square, and marks shaping guide lines with pencil or chalk; may make wooden jigs to hold work in position during cutting or assembly operations.

Cuts and shapes lumber by hand or machine: Cuts stock roughly along straight lines, using such hand saws as cross-cut saw for cutting across the grain and a ripsaw for cutting with the grain; cuts along circles and curves with a compass saw or coping saw; cuts tenons using a backsaw or ripsaw, and cuts mortises into which tenons are to fit by boring holes with brace and bit and chiseling out remaining wood; cuts grooves with a borer and router or cross-cut saw; trims and finishes component parts of joints to make them fit snugly, using such hand tools as rabbet plane, files and chisels; finishes and smooths curves with a file or sandpaper; smooths and levels flat surfaces of wood or bevels edges with a hand plane or jointer; checks smoothness of surfaces and trueness of right angles with a try square; when cutting large quantities of lumber, uses such woodworking machines as circular ripsaw or bandsaw for cutting curves or straight lines along the grain, swinging-cut-off saw for cutting across the grain, tenoner for cutting tenons, mortiser for cutting mortises, and variety saw for cutting bevels, miters, or grooves; turns round parts such as chair and table legs to desired diameter on a lathe; may carve designs on parts with such wood-carving tools as knives, chisels, hammers, and files.

Assembles and finishes articles; smooths and reduces surface of stock to exact dimensions with a sander or sandpaper; assembles component parts in jigs or on other supports and forms butt joints, miter joints, and other connections; fastens parts together with dowels, glue, nails, or screws; checks vertical and horizontal trueness of articles with carpenter's level; attaches molding, trim, and cornices by fastening with finishing nails or glue; applies sheets of veneer to surface of some articles by spreading glue on back of veneer and clamping it to article until dry; may apply oil, stain, or polish to completed articles.

Repairs fixtures and furniture: Removes damaged or defective wood part with hand tools; selects and trims piece of wood to match the size and grain of the old one; fits new part, trims joint and secures joint by means of dowel pins, nails, screws, or glue.

May perform related work: Install such hardware as hinges, catches, or drawer pulls; estimate job costs; make sketches or drawings of work to be done; inspect and approve completed articles.

Effectiveness of Norms

Only 69% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-100R norms, 84% would have been good workers. Thirty-one percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-100R norms, only 16% would have been poor workers. (Validation Sample)

Only 64% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-100R norms 91% would have been good workers. Thirty-six percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-100R norms, only 9% would have been poor workers. (Cross-Validation Sample)

Applicability of S-100R Norms

The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 898.810

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